

**The Distribution of Unionidae (Mollusca:
Bivalvia) in the Assiniboine River Drainage
in Manitoba**

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THE ASSINIBOINE RIVER DRAINAGE IN MANITOBA**

by

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Abstract

Watson, E.T., L.C. Graham, and W.G. Franzin. The distribution of Unionidae (Mollusca: Bivalvia) in the Assiniboine River drainage in Manitoba. Can. Tech. Rep. Fish. Aquat. Sci. 2232: iv + 31p.

A survey of the distribution and diversity of freshwater mussels in the Assiniboine River drainage, Manitoba was conducted during the summers of 1995 and 1996. Visual searches and raking the substrate at 63 sites resulted in the collection of 523 live specimens of twelve species. This report presents the locations, physical data collected, and the diversity and abundance of mussel species collected at each site. Previous records from the drainage are collated. Possible avenues of post-glacial dispersal are discussed.

Key Words: Mollusca; Unionidae; freshwater mussels; Assiniboine River; distribution; abundance; habitat; dispersal

Résumé

Watson, E.T., L.C. Graham, and W.G. Franzin. The distribution of Unionidae (Mollusca Bivalvia) in the Assiniboine River drainage in Manitoba. Can. Tech. Rep. Fish. Aquat. Sci. 2232 : iv + 31p.

On a procédé à un relevé sur la distribution et la diversité des mulettes (mollusques d'eau douce) dans le bassin versant de la rivière Assiniboine, au Manitoba, durant l'été, en 1995 et 1996. Des recherches à vue et des opérations de râtelage du substrat de 63 sites ont permis de récolter 523 spécimens vivants de douze espèces. Le présent rapport décrit l'emplacement, les caractéristiques physiques, la diversité et l'abondance des espèces de mulettes récoltées dans chaque site. Il collationne également des données antérieures concernant le bassin versant et présente divers scénarios de dispersion post-glaciaire.

Mots clés : Mollusca; Unionidae; mulettes; rivière Assiniboine; distribution; abondance; habitat; dispersion

INTRODUCTION

Freshwater mussels of the family Unionidae (also known as clams, unionids, or naiades) are a widely distributed fauna with representatives on every continent but Antarctica. Many members of this group have endangered populations. Nearly half of the 293 species of unionids recorded from North America are either extinct, or in peril of becoming extinct, due to anthropogenic activities such as habitat destruction, pollution, commercial over-exploitation, and the introduction of the zebra mussel (Bogan 1993, Williams et al. 1993).

Freshwater mussels are important as consumers of phytoplankton (McMahon 1991), as a food source for small aquatic mammals (Fuller 1974), for sediment mixing in lakes and rivers (McCall et al. 1979), and as a source of Japanese cultured pearl nuclei (Fassler 1991). They are also important biomonitoring tools because they are relatively sedentary, moderately sized, widely distributed, long-lived (many species living for more than 30 years, Heller 1990), somewhat tolerant to pollution, and tend to bioaccumulate many contaminants.

The zoogeography of the mollusc family Unionidae in the Assiniboine River drainage has not been well documented. Clarke (1973) describes the known distribution of unionids within the drainage based on a limited survey and previous collections. Since Clarke's study little work has been conducted on the unionid fauna of the Assiniboine River or its tributaries.

Twelve species of unionid have been recorded from the Assiniboine River drainage. Clarke (1973) reported *Fusconaia flava* Rafinesque, *Amblema plicata* Say, *Quadrula quadrula* Rafinesque, *Lasmigona complanata complanata* Barnes, *Lasmigona compressa* Lea, *Anodontoides ferussacianus* Lea, *Pyganodon grandis* Say, *Strophitus undulatus* Say, *Ligumia recta* Lamarck, *Lampsilis siliquoidea* Barnes, and *Lampsilis ovata* Say. Scaife and Janusz reported *Potamilus alatus* Say from the Assiniboine River in 1992.

This report summarizes the data collected as part of a study conducted during the summers of 1995 and 1996. The primary purpose was to document the distribution and diversity of freshwater mussels in the Assiniboine River drainage in Manitoba.

METHODS

SAMPLING

The Assiniboine River has a drainage area of approximately 153,000 km², and can be characterized as a seventh order, low slope, turbid, prairie stream.

In the summer of 1995, a preliminary survey of the mussels in tributaries of the Assiniboine River was conducted. In addition, two trips were made down the lower Assiniboine River from Portage la Prairie, Manitoba, to its confluence with the Red River at Winnipeg. Sampling sites were selected by dividing the river into sixteen 10-km blocks to stratify the sampling, and randomly selecting one 1-km site within each block. A cross-section of the river was sampled at the beginning of each 1-km site. Mussels were collected by raking with a 12 tooth mini-bullrake five times at five equidistant points across the river (i.e. 25 rakes each transect). Depth and substrate type were recorded at each point. Collecting took approximately 30 minutes per site. The approximately 1000 km of Assiniboine River mainstem above Portage la Prairie was not sampled due to the lack of time and resources.

During the summer of 1996, a more rigorous survey of the mussel resources in tributaries of the Assiniboine River was undertaken. Sampling sites were selected according to accessibility at approximately 20 km intervals along Assiniboine River tributaries that were fourth order or larger. Thirty person-minutes were spent searching for mussels at each site by systematically walking back and forth across each site working in an upstream direction. In areas too deep or turbid for a visual search, mussels were collected by raking the

substrate with a 12 tooth mini-bullrake for 30 minutes. All individuals were fixed in 10% formalin, brought to the laboratory, stored in 70% ethanol, and later identified.

RECORDS

Where possible, the following were reported for each site: 1) Location, identified by road crossing or town name; 2) GPS position in latitude and longitude, to the nearest minute; 3) Date of the collection; 4) Stream order (ORD), as determined by Strahler's (1952) stream ordering method; 5) Stream width (W); 6) Substrate types utilized by living mussels, categorized as silt, sand, gravel, cobble and/or clay; 7) Water depth (D); 8) Species collected at each site; 9) Abundance (N) or evidence (EV, indicating the presence of empty valves only) of each species collected at a site.

Previous records from the drainage were taken primarily from Clarke's (1973) survey and the collections that he had re-examined.

Species and common names in this report are those used in Turgeon et al. (1998).

RESULTS AND DISCUSSION

Of the 185 sites visited, 63 yielded 523 live specimens of twelve species. First and second order sites were intermittent and harbored no mussels. Figure 1 shows the names of the major rivers and tributaries sampled. Figure 2 shows the locations of the collection sites. Collection records for this survey are summarized in Appendices 1 and 2 with species distributions shown in Figures 3-14. Previous collections from the Assiniboine River drainage are summarized in Appendix 3.

The distribution maps illustrate the macrohabitat preferences of the individual species. Species such as *Fusconaia flava*, *Amblema plicata*, *Quadrula quadrula*, *Potamilus alatus*, *Ligumia recta* and *Lampsilis ovata*, which are typical of large streams, were found only in the Assiniboine

or high order tributaries. Large river species found in the high (5th and 6th) order tributaries could be assumed to occur in suitable habitats in the Assiniboine River mainstem above Portage la Prairie. Species typical of small streams, such as *Anodontoidea ferussacianus* and *Lasmigona compressa*, were found primarily at low (3rd and 4th) order sites. Species such as *Lampsilis siliquoidea* and *Pyganodon grandis*, which have broad habitat tolerances, were found throughout the drainage.

The Assiniboine River drainage basin has been re-invaded by unionids following the retreat of the Wisconsin ice sheet which began about 11,500 years ago (Clayton 1983). The 12 unionid species recovered are probably of Mississippian origin, entering via a former confluence between the Minnesota (upper Mississippi) and Red rivers (Johnson 1980). Pro-glacial lakes and drainage courses would have provided initial migration routes for fish hosts (Stewart and Lindsey 1983), allowing the ubiquitous and cold-hardy *Pyganodon grandis* and *Lampsilis siliquoidea* to be the first invaders. Their fossil remains have been found in 11,500-year-old ice-contact deposits in North Dakota (Tuthill 1961, Tuthill et al. 1964). *Lasmigona compressa*, *Lampsilis siliquoidea* and *Anodontoidea ferussacianus* may have invaded the Hudson Bay drainage from the Great Lakes-St. Lawrence River System via a connection with the Rainy River-Winnipeg River System at Saganaga Lake (Clarke 1973, Johnson 1980). The transfer of new biota (fish hosts and mussels) is still possible when the Minnesota and Red Rivers occasionally are joined during periods of high water at Big Stone Lake and Lake Traverse (Clarke 1973).

The fluted shell, *Lasmigona costata* Rafinesque, has been collected in the Red River (Cvancara 1970, Clarke 1973, Dall 1905) and Winnipeg River systems (Clarke 1973, unpublished data), but was not found in our survey. Further collections may eventually expand its range to include the Assiniboine River drainage.

This study provides some of the first baseline data on species occurrences in this drainage basin. Continued collections in the Assiniboine River drainage will be important to monitor changes in species distributions and to discover the occurrence of new freshwater mussel species, particularly the highly invasive zebra and quagga mussels.

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REFERENCES

- BOGAN, A.E. 1993. Freshwater bivalve extinctions (Mollusca: Unionidae): a search for causes. *Amer. Zool.*, 33: 599-609.
- CLARKE, A.H. 1973. The freshwater molluscs of the Canadian interior basin. *Malacologia*, 13: 1-509.
- CLARKE, A.H. 1981. The Freshwater Molluscs of Canada. National Museum of Natural Sciences. Ottawa. 446 pp.
- CLAYTON, L. 1983. Chronology of drainage of Lake Agassiz to Lake Superior, pp.291-307. In J.T. Keller and L. Clayton (ed.) *Glacial Lake Agassiz*. Geol. Assn. Can. Spec. Pap. 26.
- CVANCARA, A.M. 1970. Mussels (Unionidae) of the Red River Valley in North Dakota and Minnesota, U. S. A. *Malacologia*, 10: 57-92.
- DALL, W.H. 1905. Land and fresh water mollusks of Alaska and adjoining regions. Harriman Alaska, Exped. 13: 1-171.
- FASSLER, C.R. 1991. Farming jewels: the aquaculture of pearls. *Aquaculture Magazine*, 17(5): 34-52.
- FULLER, S.L.H. 1974. Clams and Mussels (Mollusca: Bivalvia), pp. 215-312. In C.W. Hart, Jr., and S.L.H. Fuller, (ed.) *Pollution Ecology of Freshwater Invertebrates*. Academic Press, New York.
- HELLER, J. 1990. Longevity in molluscs. *Malacologia*, 31: 259-295.
- HOEH, W.R. 1990. Phylogenetic relationships among eastern North American *Anodonta* (Bivalvia: Unionidae). *Malacological Review*, 23(1-2): 63-82.
- JOHNSON, R.I. 1980. Zoogeography of North American Unionacea (Mollusca: Bivalvia) north of the maximum Pleistocene glaciation. *Bull. Mus. Comp. Zool.*, 149: 77-189.
- MCCALL, P.L., M.J.S. TEVESZ, and S.F. SCHWELGIEN. 1979. Sediment mixing by *Lampsilis radiata siliquoidea* (Mollusca) from western Lake Erie. *Journal of Great Lakes Research*, 5: 105-111.
- MCMAHON, R.F. 1991. Mollusca: Bivalvia. p. 315-99 In J.H. Thorp and A.P. Covich (ed.) *Ecology and Classification of North American Freshwater Invertebrates*. Academic Press, San Diego.
- PIP, E. 1995. Cadmium, lead and copper in freshwater mussels from the Assiniboine River, Manitoba, Canada. *J. Moll. Stud.*, 61: 295-302.
- SCAIFE, B., AND L. JANUSZ. 1992. A survey of freshwater mussels on the Assiniboine River, September 1992. Manitoba Department of Natural

Resources Fisheries Branch MS
Report No. 92-02.

- STRAHLER, A.N. 1952. Hypsometric (area-altitude) analysis of erosional topography. Bulletin of the Geological Society of America, 63: 1117-1142.
- TURGEON, D. D., J. F. QUINN, JR., A. E. BOGAN, E. V. COAN, F. G. HOCHBERG, W. G. LYONS, P. M. MIKKELSEN, R. J. NEVES, C. F. E. ROPER, G. ROSENBERG, B. ROTH, A. SCHELTEMA, F. G. THOMPSON, M. VECCHIONE, AND J. D. WILLIAMS. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks, 2nd edition. American Fisheries Society Special Publication no. 16.
- TUTHILL, S.J. 1961. A molluscan fauna and late Pleistocene climate in Southeastern North Dakota. Proc. N. Dak. Acad. Sci., 11: 19-26.
- TUTHILL, S.J., L. CLAYTON, and W.M. LAIRD. 1964. A comparison of a fossil Pleistocene molluscan fauna from North Dakota with a Recent molluscan fauna from Minnesota. Am. Midl. Nat., 71: 344-362.
- WHITEAVES, J.F. 1895. Notes of recent Canadian Unionidae. Canadian Record of Science, January. 14 pp.
- WILLIAMS, J.D., M.L. WARREN, K.S. CUMMINGS, J.L. HARRIS, and R.J. NEVES. 1993. Conservation status of freshwater mussels of the United States and Canada. Fisheries: Bull. Am. Fish. Soc., 18: 6-22.

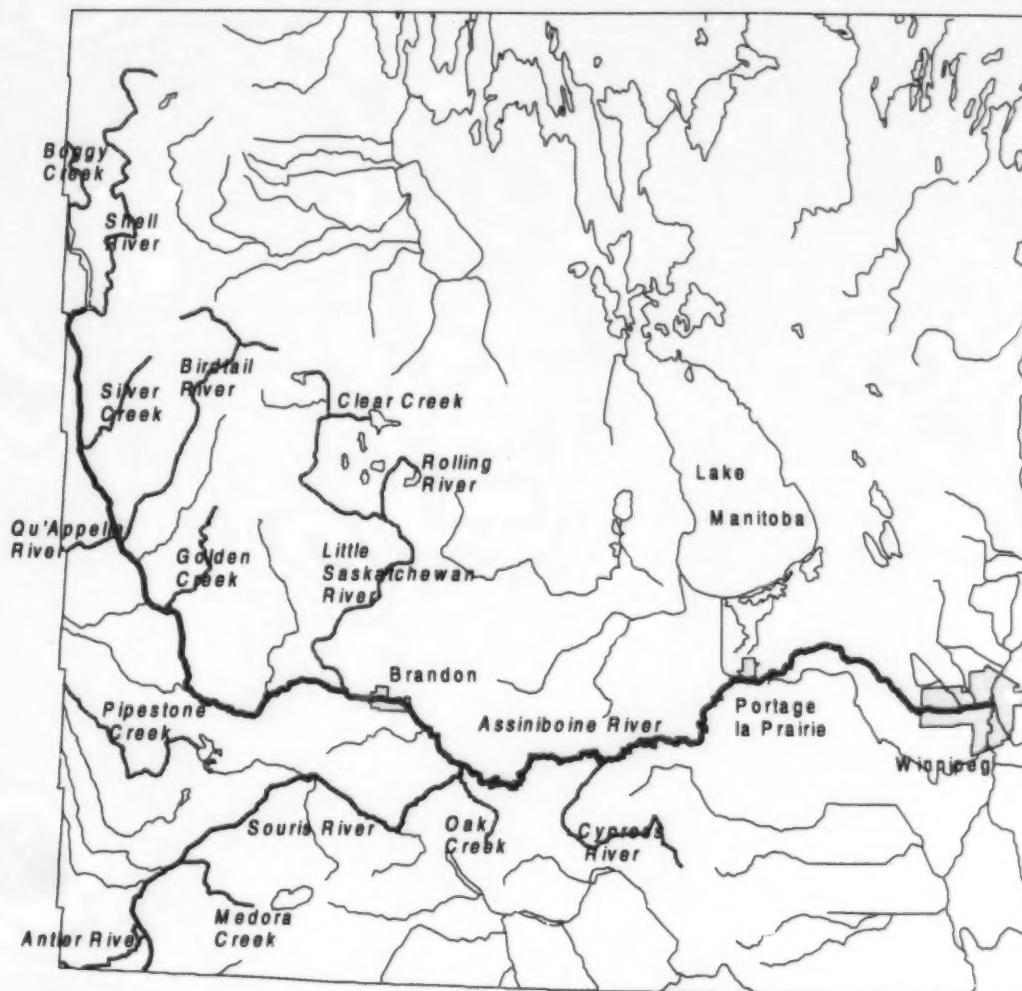


Figure 1. Reference map for the Assiniboine River drainage in Manitoba.

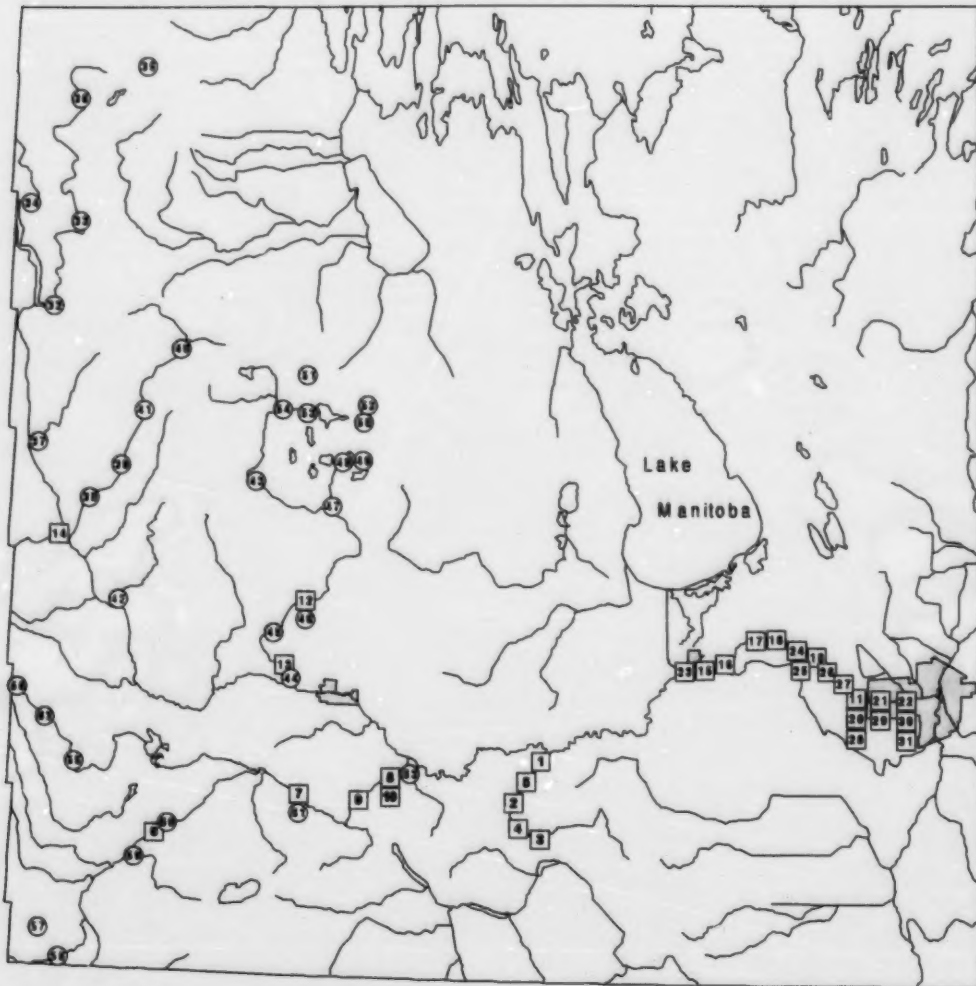


Figure 2. Sites of the 1995 (□) and 1996 (○) collections. Numbers refer to collections described in Appendix 1.

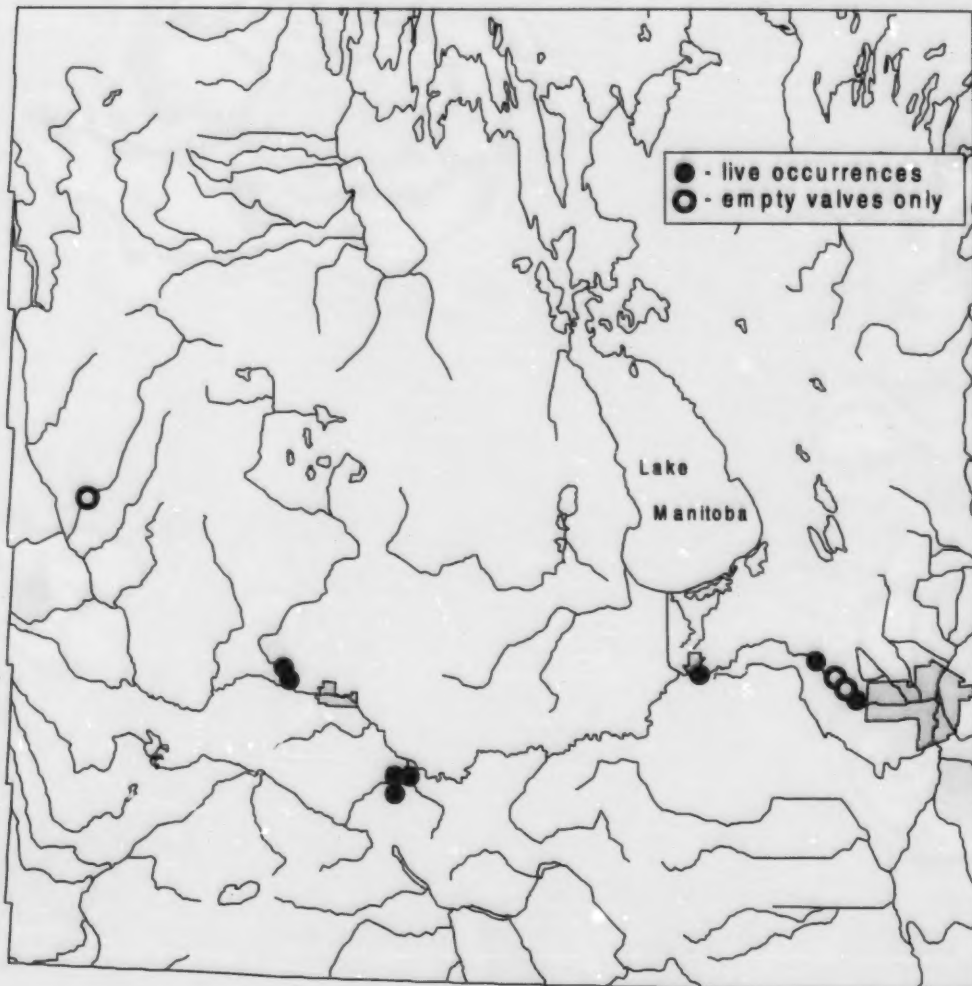


Figure 3. Collection localities for the pigtoe, *Fusconaia flava*.

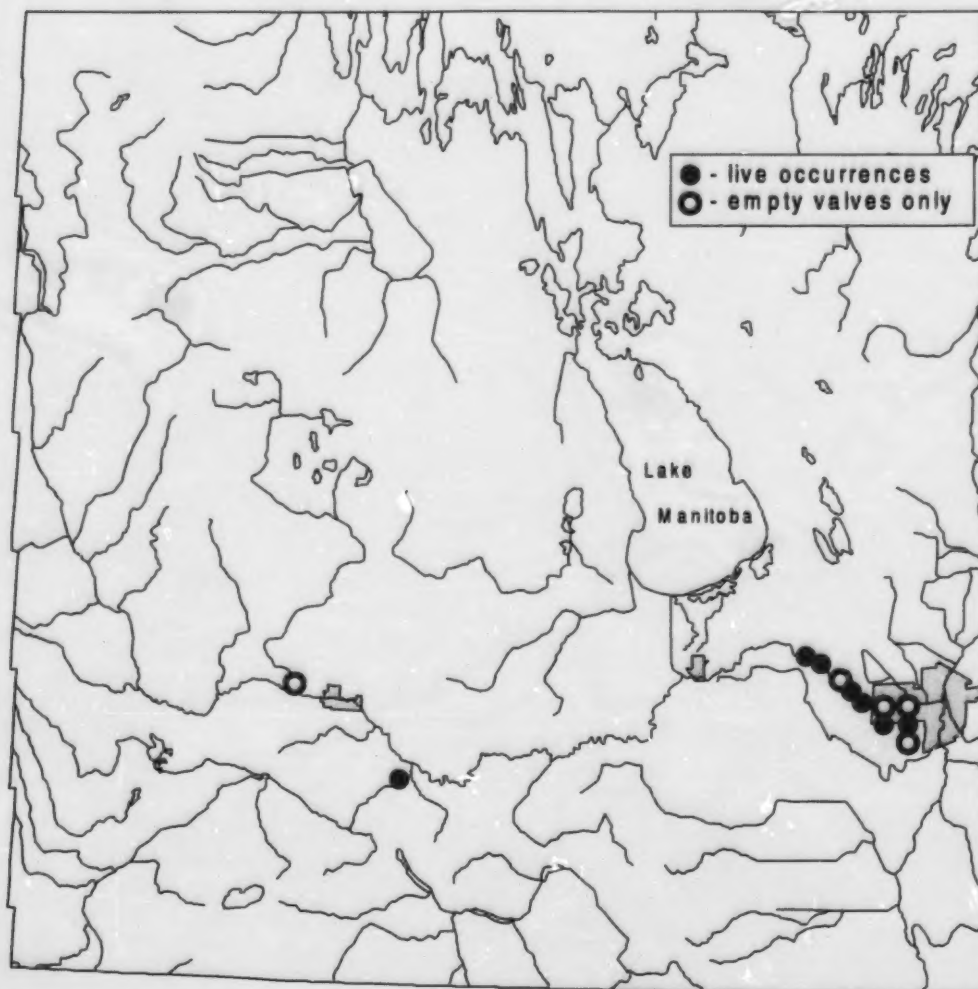


Figure 4. Collection localities for the three-ridge, *Amblema plicata*.

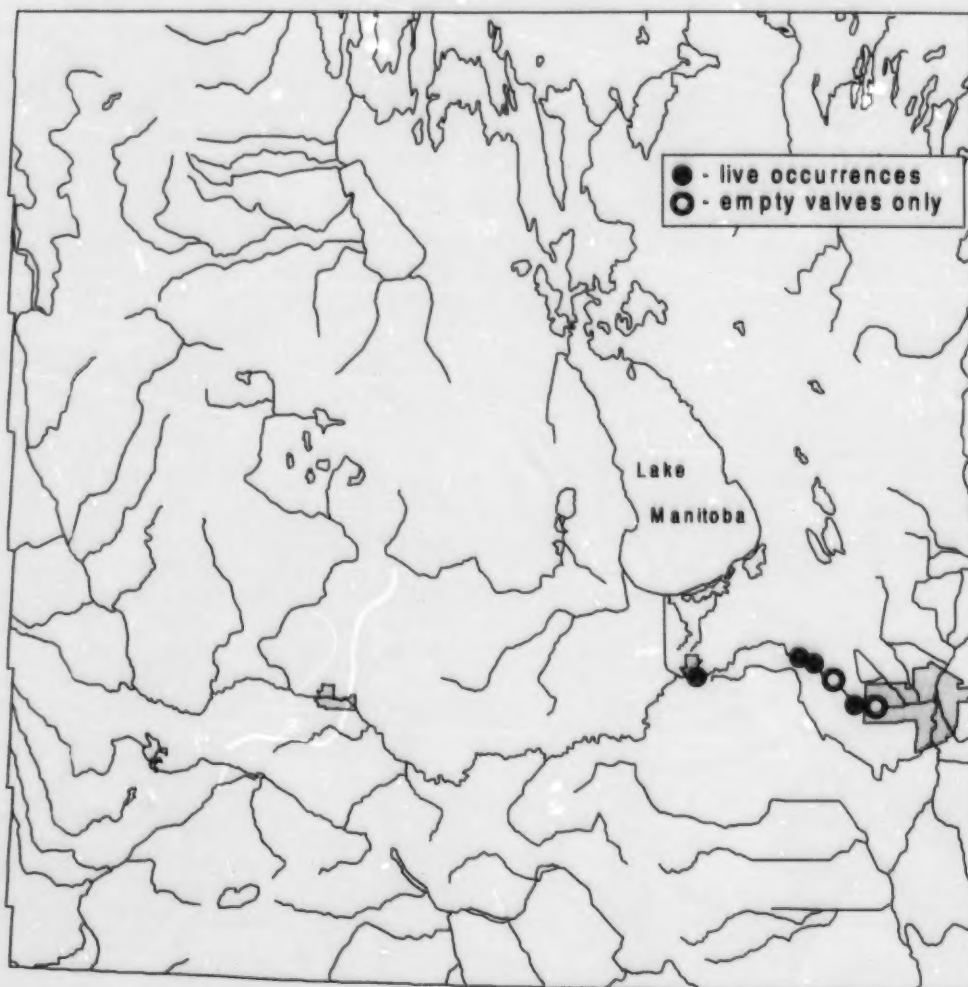


Figure 5. Collection localities for the mapleleaf, *Quadrula quadrula*.

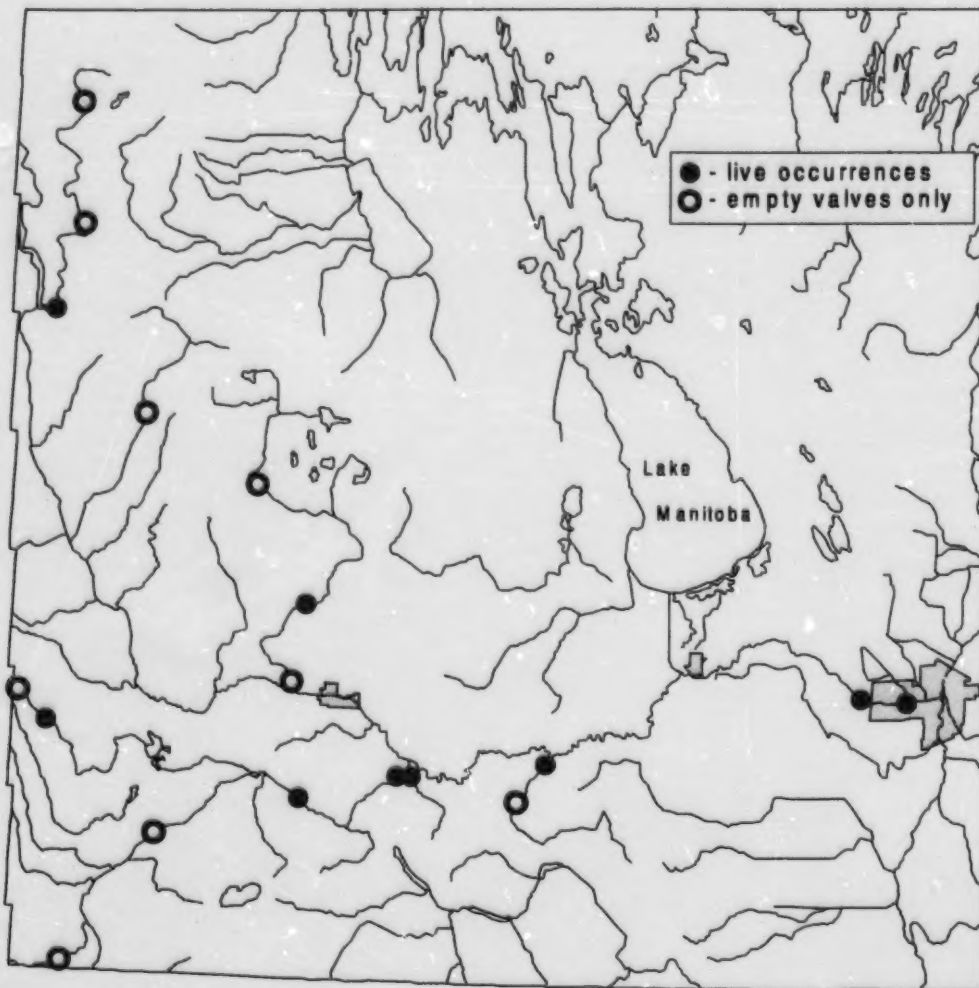


Figure 6. Collection localities for the white heelsplitter, *Lasmigona complanata complanata*.

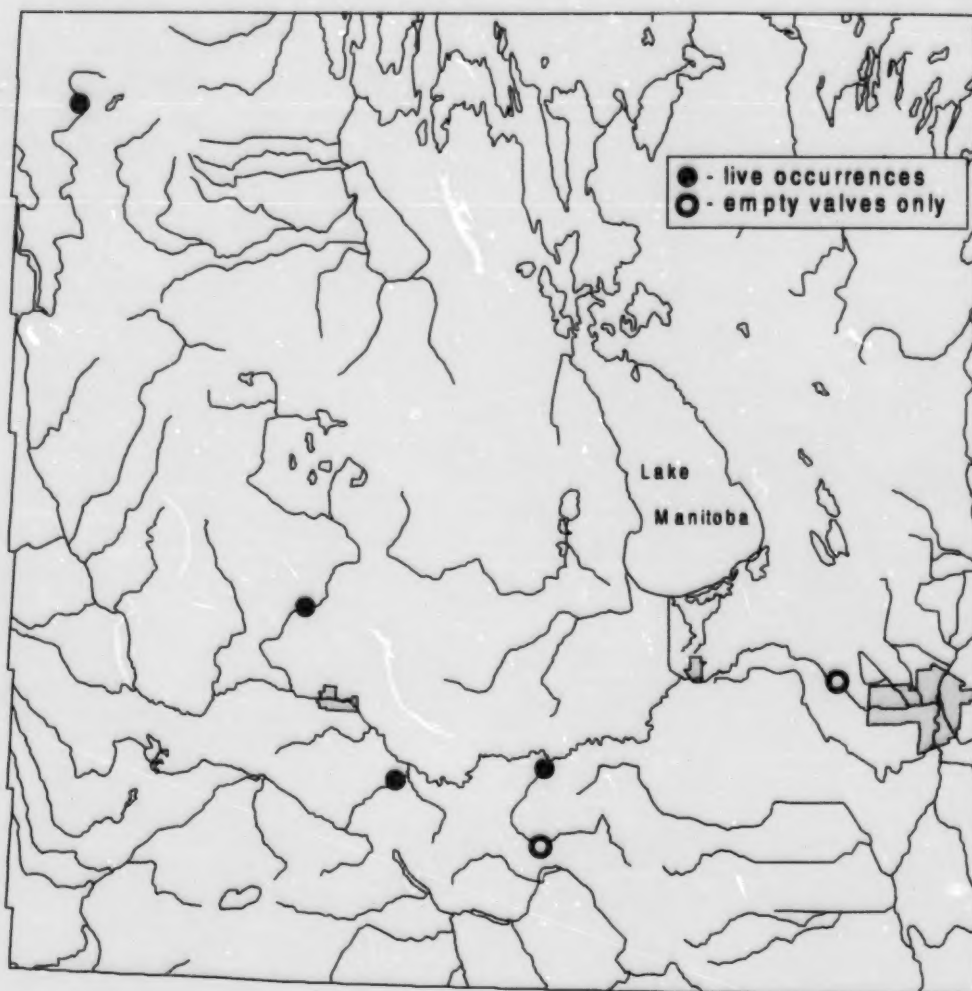


Figure 7. Collection localities for the creek heelsplitter, *Lasmigona compressa*.

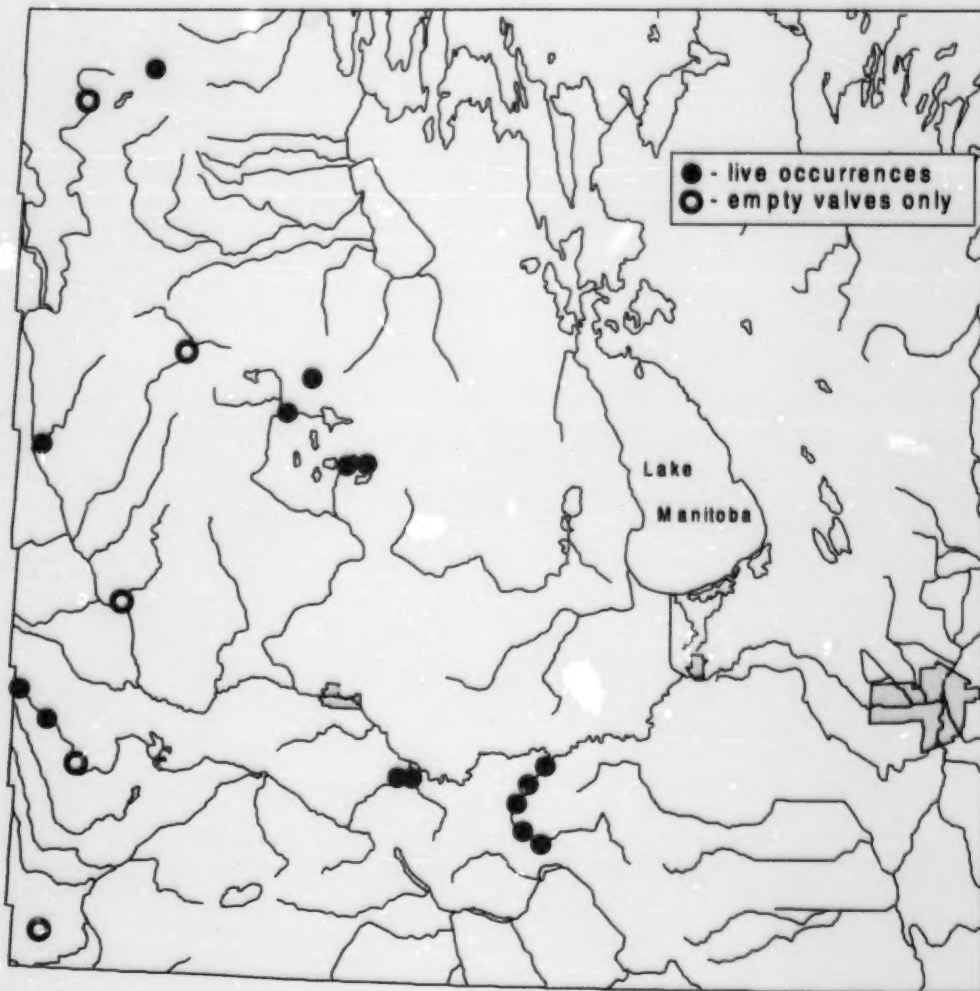


Figure 8. Collection localities for the cylindrical floater, *Anodontoides ferussacianus*.

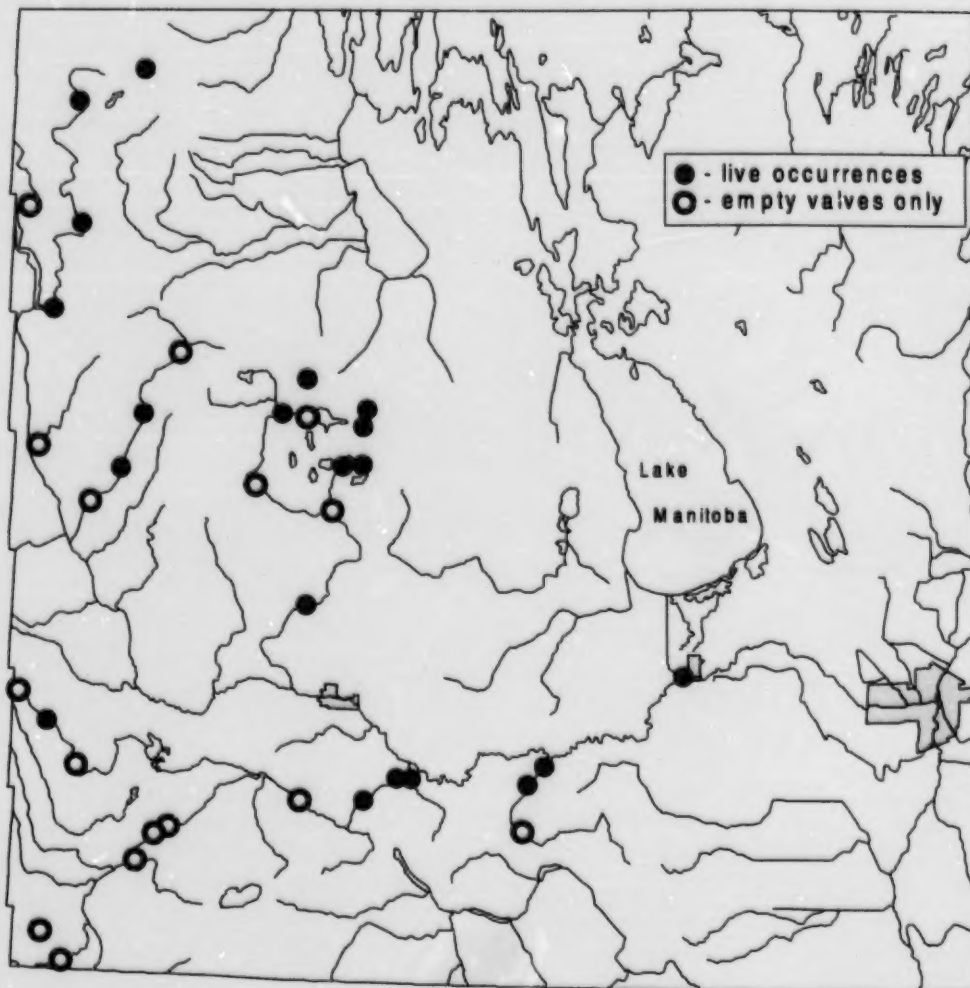


Figure 9. Collection localities for the giant floater, *Pyganodon grandis*.

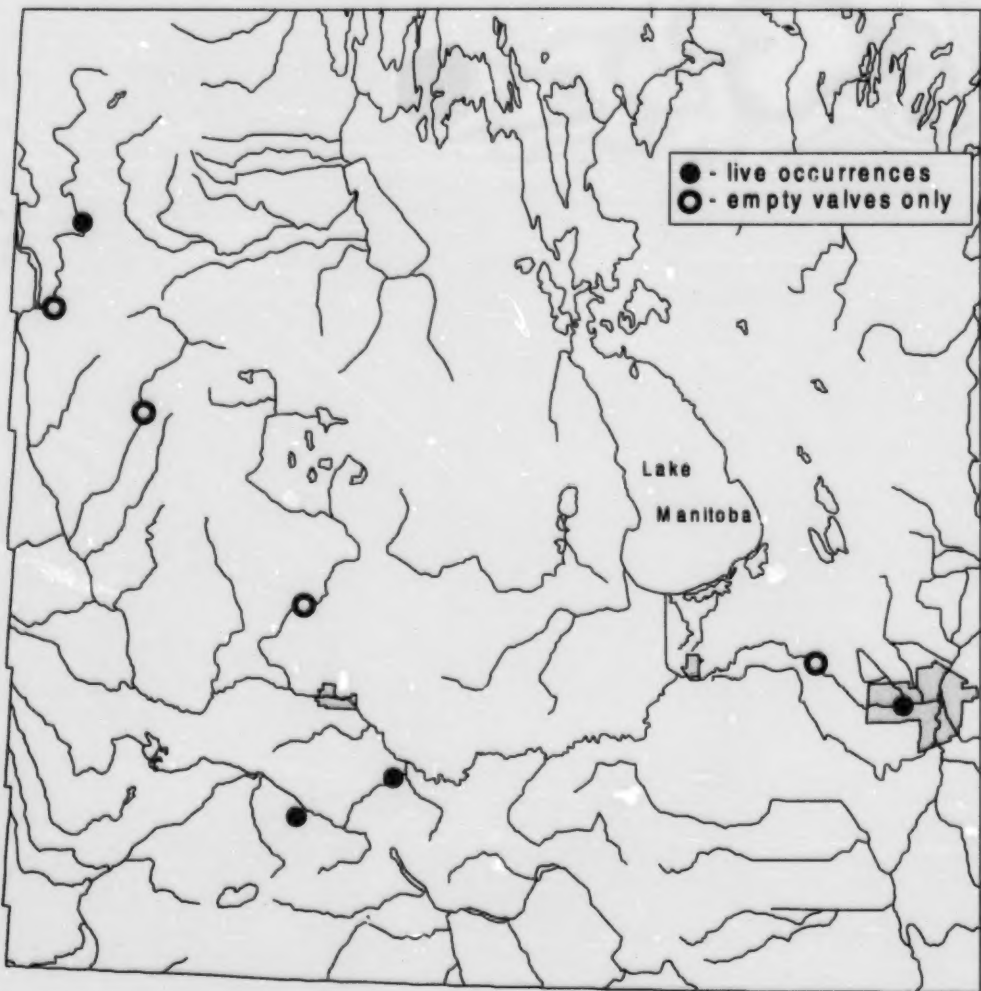


Figure 10. Collection localities for the squawfoot, *Strophitus undulatus*.

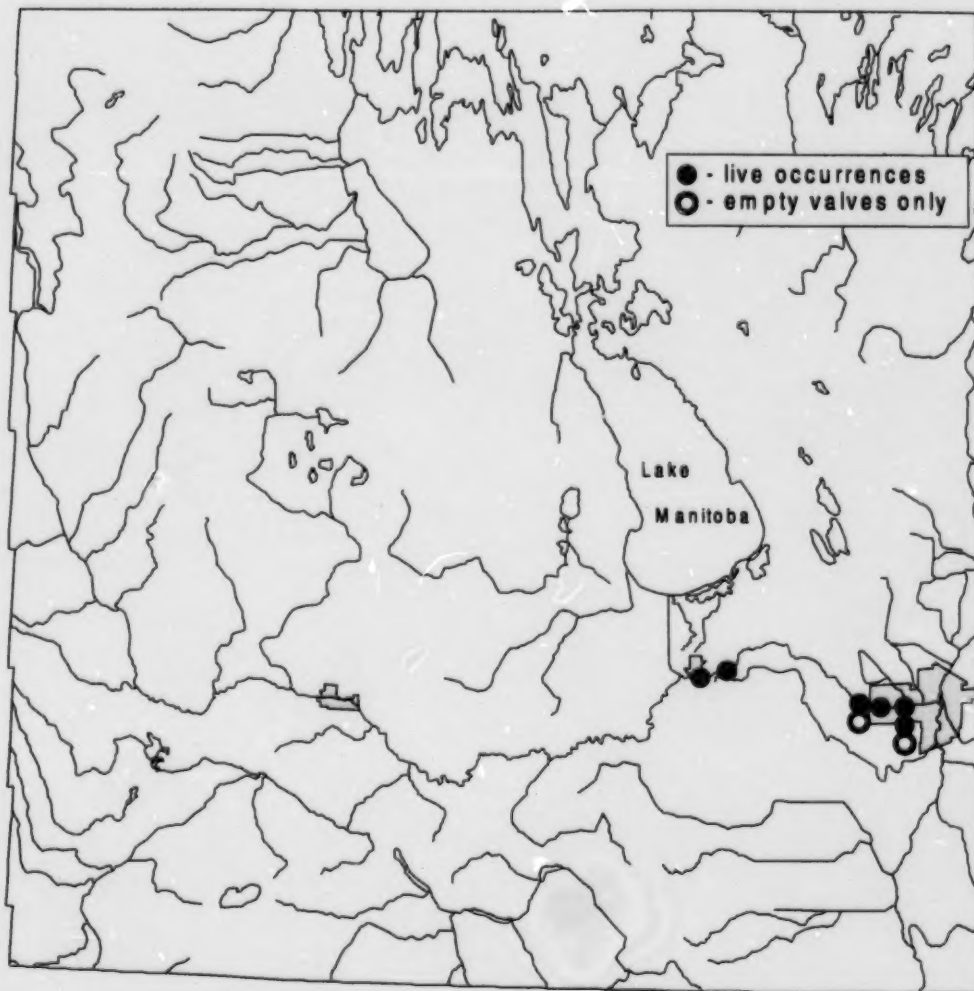


Figure 11. Collection localities for the pink heelsplitter, *Potamilus alatus*.

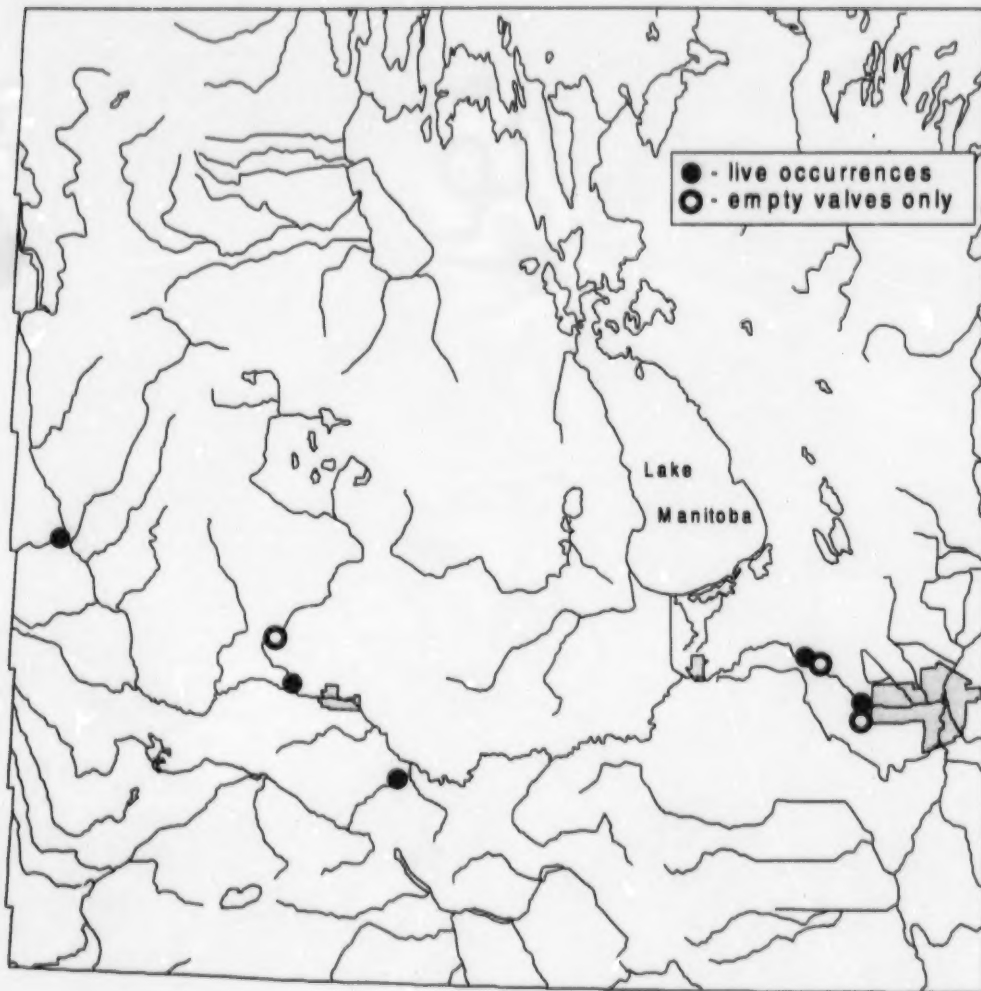


Figure 12. Collection localities for the black sandshell, *Ligumia recta*.

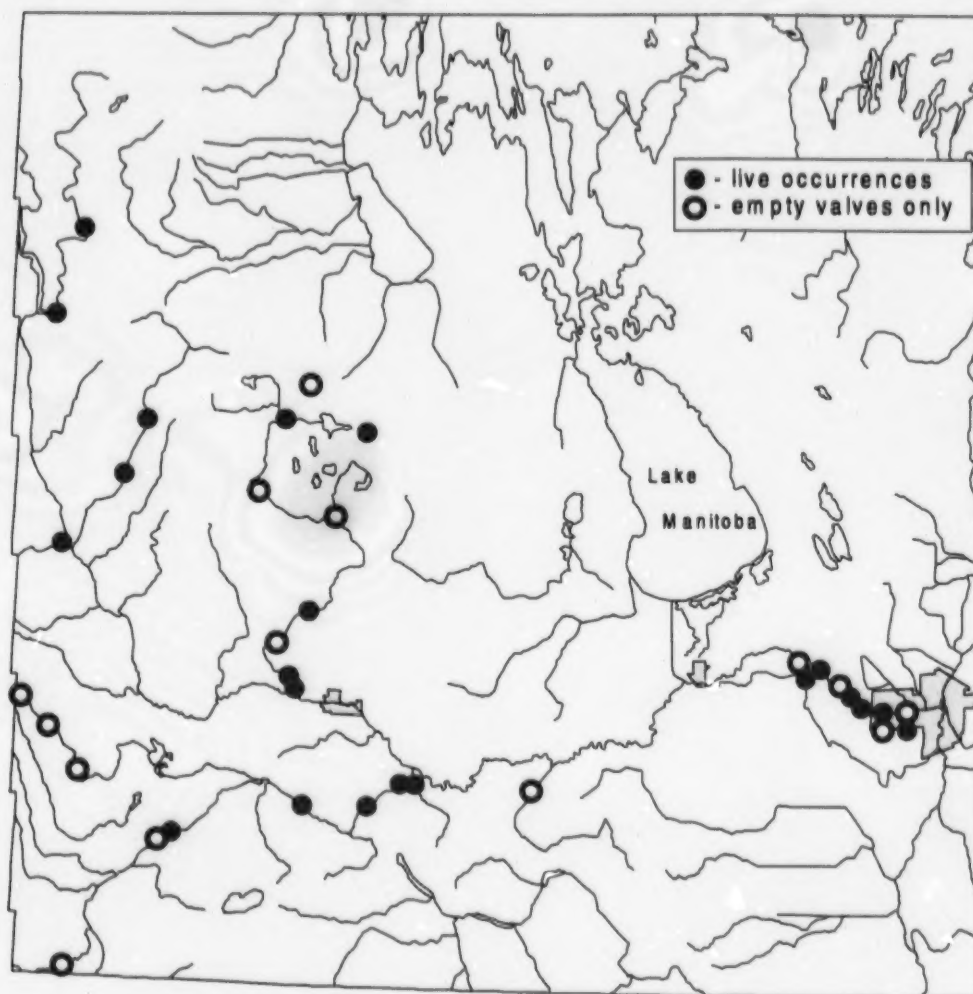


Figure 13. Collection localities for the fatmucket, *Lampsilis siligoidea*.

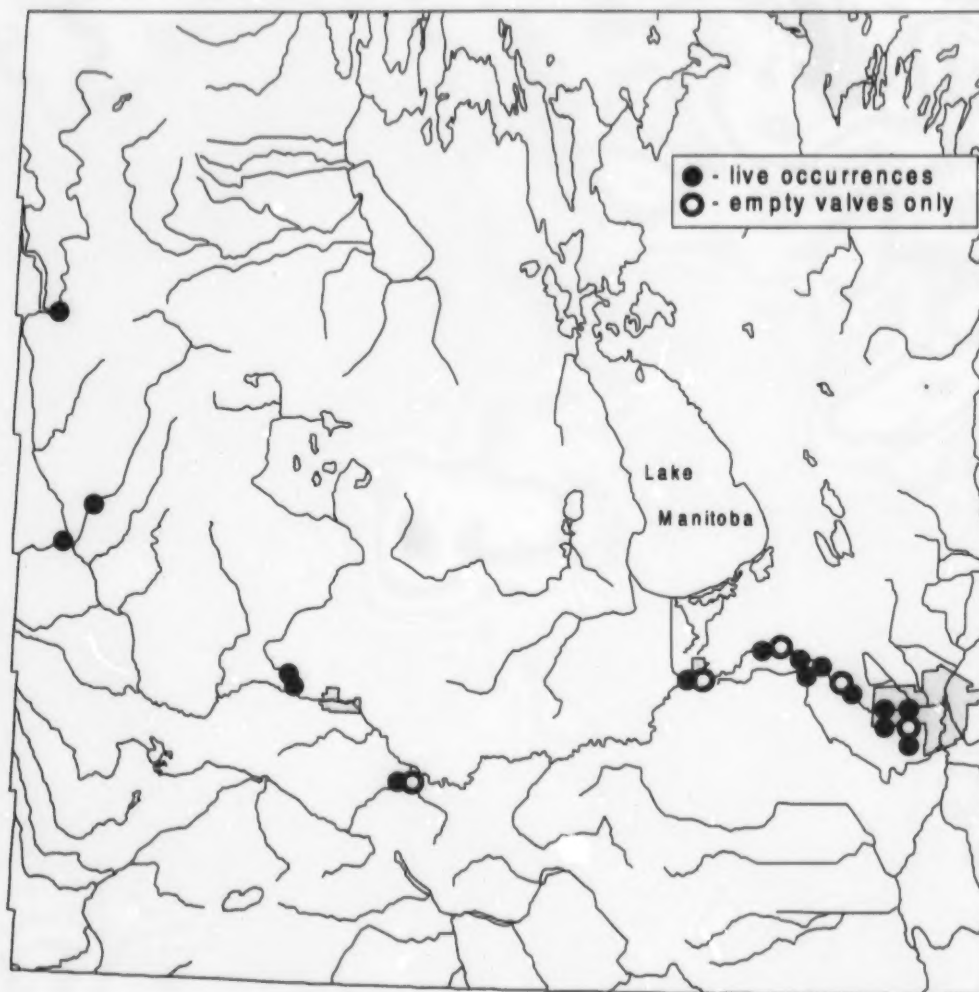


Figure 14. Collection localities for the pocketbook, *Lampsilis ovata*.

APPENDIX 1: SPECIES AND PHYSICAL DATA AT EACH LOCATION

LOCATION	N LAT. W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
1. Cypress River, 5 mi N of Holland and 3 mi W of PTH 34	49°39' 98°55'	5/4/96	4		silt/fine shale silt/fine shale silt/fine shale silt/fine shale	75 75 75 75	<i>Lasmigona complanata</i> <i>Lasmigona compressa</i> <i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	1 1 5 3
2. Cypress River, 1 mi E of Cypress River and 1 mi S of PTH 2	49°32' 99°06'	5/4/95	3		shale	75	<i>Lasmigona complanata</i> <i>Anodontoides ferussacianus</i>	EV 13
3. Cypress River, St. Alphonse	49°26' 98°59'	5/11/95	3		fine shale	15	<i>Lasmigona compressa</i> <i>Anodontoides ferussacianus</i>	EV 12
4. Cypress River, 1.5 mi N and 1 mi W of St. Alphonse	49°27' 98°01'	5/11/95	3		silt/sand	50	<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	24 EV
5. Cypress River, 6 mi W of Holland and 6 mi N of PTH 2	49°35' 99°01'	5/11/95	3		mud cobble	75 75	<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoides</i>	5 7 EV
6. Souris River, PR 345 (9 mi E of Bede)	49°23' 100°45'	5/18/95	6				<i>Lasmigona complanata</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoides</i>	EV EV EV
7. Souris River, Buncloody	49°32' 100°03'	5/18/95	6		shale/cobble shale/cobble	100 100	<i>Lasmigona complanata</i> <i>Lampsilis siliquoides</i>	1 5
8. Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank)	49°37' 99°35'	5/18/95	6		cobble/gravel/silt cobble/gravel/silt cobble/gravel/silt cobble/gravel/silt cobble/gravel/silt cobble/gravel/silt cobble/gravel/silt cobble/gravel/silt	100 100 100 100 100 100 100 100	<i>Fusconaia flava</i> <i>Anblema plicata</i> <i>Lasmigona complanata</i> <i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Strophitus undulatus</i> <i>Ligumia recta</i> <i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i>	25 3 14 2 4 1 2 6 6

LOCATION	N LAT. W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
9. Souris River, PTH 2 (1 mi S and 1.5 mi E of Wawanesa)	49°34' 99°43'	6/28/95	5	20.8	silt silt	75 75	<i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	9 8
10. Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank)	49°37' 99°35'	6/29/95	6		gravel/sand sand gravel/sand sand	50 20 50 20	<i>Fusconaia flava</i> <i>Lasmigona complanata</i> <i>Lasmigona compressa</i> <i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Strophitus undulatus</i> <i>Ligumia recta</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	1 6 1 4 EV EV 2 8 1
11. Assiniboine River, Hwy 1	49°53' 97°30'	7/12/95	7		silty sand silty sand silty sand silty sand silty sand	150 150 150 150 150	<i>Fusconaia flava</i> <i>Ambleria plicata</i> <i>Potamilus alatus</i> <i>Ligumia recta</i> <i>Lampsilis siliquoidea</i>	1 9 16 2 3
12. Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City	50°08' 100°07'	7/19/95	5		cobble sand sand sand cobble	20 52 52 52 20	<i>Lasmigona complanata</i> <i>Lasmigona compressa</i> <i>Pyganodon grandis</i> <i>Strophitus undulatus</i> <i>Lampsilis siliquoidea</i>	1 2 2 1 22
13. Little Saskatchewan River, 4 mi S and 2 mi E of Carnegie	49°54' 100°03'	7/20/95	5		cobble/sand cobble/sand cobble/sand	50 50 50	<i>Fusconaia flava</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	1 2 1
14. Qu'Appelle River, 1 mi W of St. Lazare	50°27' 101°25'	7/26/95			sand	50 50 50	<i>Ligumia recta</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	2 11 2
15. Assiniboine River, river km 154	49°56' 98°17'	8/9/95	7		cobble/sand cobble/sand gravel/sand/clay	135 135 100	<i>Fusconaia flava</i> <i>Quadrula quadrula</i> <i>Potamilus alatus</i> <i>Lampsilis ovata</i>	1 1 1 EV

LOCATION	N LAT W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
16. Assiniboine River, river km 140	49°57' 98°09'	8/11/95	7		silt/sand	193	<i>Potamilius alatus</i>	1
17. Assiniboine River, river km 115	50°01' 97°59'	8/11/95	7		sand	88	<i>Lampsilis ovata</i>	1
18. Assiniboine River, river km 109	46°39' 99°06'	8/12/95	7				<i>Lampsilis ovata</i>	EV
19. Assiniboine River, river km 73	49°59' 97°41'	8/12/95	7		sand gravel/sand sand/cobble	95 128 88	<i>Fusconaia flava</i> <i>Quadrula quadrula</i> <i>Ambelma plicata</i> <i>Strophitus undulatus</i> <i>Ligumia recta</i>	1 1 3 EV EV
20. Assiniboine River, river km 47	49°54' 97°32'	8/13/95	7		gravel/sand sand/gravel clay/cobble/sand clay/cobble/sand	128 90 160 160	<i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i> <i>Quadrula quadrula</i> <i>Lasmigona complanata</i> <i>Ligumia recta</i>	1 1 1 1 EV
21. Assiniboine River, river km 28	49°52' 97°25'	8/13/95	7		cobble/gravel cobble/gravel cobble/gravel	161 175 193	<i>Ambelma plicata</i> <i>Potamilius alatus</i> <i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i>	EV 1 2 1
22. Assiniboine River, river km 15	49°51' 97°16'	8/17/95	7		clay/cobble silt/debris	190 136	<i>Ambelma plicata</i> <i>Potamilius alatus</i> <i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i>	EV 1 EV 1
23. Assiniboine River, river km 157	49°57' 98°19'	9/15/95	7		gravel/sand clay/gravel/sand	145 115	<i>Pyganodon grandis</i> <i>Lampsilis ovata</i>	1 1
24. Assiniboine River, river km 84	50°00' 97°46'	9/16/95	7		sand/clay/silt sand/cobble/clay	120	<i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i>	EV 1
25. Assiniboine River, river km 77		9/17/95	7		sand/cobble/clay sand/cobble/clay	140 140	<i>Ambelma plicata</i> <i>Quadrula quadrula</i>	1 1

LOCATION	N LAT W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
26. Assiniboine River, river km 64	49°57' 97°38'	9/17/95	7		sand/cobble/clay sand/cobble/clay sand/cobble/clay	140 140 140	<i>Ligumia recta</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	1 1 3
							<i>Fusconaia flava</i> <i>Ambleria plicata</i> <i>Quadrula quadrula</i> <i>Lasmigona compressa</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	EV EV EV EV EV EV
27. Assiniboine River, river km 57	49°55' 97°35'	9/17/95	7		cobble/clay	93	<i>Fusconaia flava</i> <i>Ambleria plicata</i>	EV 3
					cobble/clay cobble/clay	93 93	<i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	2 1
28. Assiniboine River, river km 45	49°53' 97°30'	9/17/95	7		sand/clay	240	<i>Potamilus alatus</i>	EV
29. Assiniboine River, river km 32	49°51' 97°27'	9/18/95	7		sand/clay sand/clay sand/clay	105 105 82	<i>Quadrula quadrula</i> <i>Ambleria plicata</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	2 2 EV 1
30. Assiniboine River, river km 23	49°52' 97°22'	9/18/95	7		cobble/sand gravel/sand sand/cobble sand/cobble	99 208 108 108	<i>Ambleria plicata</i> <i>Potamilus alatus</i> <i>Potamilus alatus</i> <i>Lampsilis siliquoidea</i> <i>Lampsilis ovata</i>	1 1 1 1 EV
31. Assiniboine River, river km 18	49°52' 97°18'	9/18/95	7		cobble/gravel/sand gravel/cobble	148 87	<i>Ambleria plicata</i> <i>Lasmigona complanata</i> <i>Strophitus undulatus</i> <i>Potamilus alatus</i> <i>Lampsilis ovata</i>	EV 2 1 EV 1
32. Shell River, PTH 83 (1 mi N and 2 mi E of Inglis)	50°57' 101°18'	7/3/96	5	18.4	gravel/cobble silt/gravel silt/gravel	87 51 51	<i>Lampsilis ovata</i> <i>Lasmigona complanata</i> <i>Pyganodon grandis</i>	1 1 1

LOCATION	N LAT W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
33. Shell River, PTH 5 (1 mi N of Shevlin)	51°11' 101°15'	7/3/96	5	23.3	silt/gravel silt/gravel	51 51	<i>Strophitus undulatus</i> <i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i>	EV 3 1
34. Boggy Creek, 6 mi W and 3 mi N of Roblin	51°16' 101°29'	7/3/96	5	8.5	sand/silt	68	<i>Lasmigona complanata</i> <i>Pyganodon grandis</i>	EV 1
35. East Shell River, PR 366 (6 mi N of PR 367 and 7 mi S of PR 271)	51°41' 100°39'	7/4/96	3		silt silt		<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	16 1
36. Shell River, PR 367 (6 mi E and 2.5 mi N of Boggy Creek)	51°36' 101°15'	7/4/96	5	9.8	gravel/cobble/silt gravel/cobble/silt	42 42	<i>Lasmigona complanata</i> <i>Lasmigona compressa</i> <i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	EV 1 EV 5
37. Silver Creek, 1.5 mi E and 2.5 S of Gambler	50°33' 101°22'	7/5/96	4	4.1	gravel/silt/sand	34	<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	4 EV
38. Birdtail River, PR 477 (3 mi S and 4 mi W of Birdie)	50°22' 101°08'	7/5/96	4	20.8			<i>Fusconaia flava</i> <i>Pyganodon grandis</i> <i>Lampsilis ovata</i>	EV EV EV
39. Birdtail River, PTH 16 (1 mi N and 1.5 mi W of Solsgirth)	50°30' 100°57'	7/5/96	4	13.6	shale/silt shale/silt	52 52	<i>Pyganodon grandis</i> <i>Lampsilis siliquoides</i>	5 2
40. Birdtail River, 1 mi N and 1 mi E of Mears	50°50' 100°42'	7/6/96	3				<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	EV EV
41. Birdtail River, PR 359 (7 mi W of Vista)	50°37' 100°52'	7/6/96	4	15	silt/shale/gravel silt/shale/gravel	46 46	<i>Lasmigona complanata</i> <i>Pyganodon grandis</i> <i>Strophitus undulatus</i> <i>Lampsilis siliquoides</i>	EV 3 EV 4

LOCATION	N LAT. W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
42. Golden Creek, 1 mi S and 1 mi E of Glenloch	50°05' 100°57'	7/8/96	4	6.5			<i>Anodontoides ferussacianus</i>	EV
43. Little Saskatchewan River, PR 354 (3 mi S of Elphinstone)	50°28' 100°19'	7/8/96	4	17.5			<i>Lasmigona complanata</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoides</i>	EV EV EV
44. Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov. Rec. Park	49°52' 100°08'	7/9/96	5	16.6	sand/gravel	42	<i>Fusconia flava</i> <i>Aniblema plicata</i> <i>Lasmigona complanata</i> <i>Ligumia recta</i> <i>Lampsilis siliquoides</i> <i>Lampsilis ovata</i>	1 EV EV 5 2 11
45. Little Saskatchewan River, 1 mi S of Rivers	50°01' 100°14'	7/9/96	5	9.1			<i>Ligumia recta</i> <i>Lampsilis siliquoides</i>	EV EV
46. Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City	50°08' 100°07'	7/9/96	5	22.8	silt/cobble	31	<i>Lasmigona complanata</i> <i>Pyganodon grandis</i> <i>Strophitus undulatus</i> <i>Lampsilis siliquoides</i>	EV 4 EV 16
47. Rolling River, 7.5 mi S and 2 mi W of Erikson	50°23' 99°57'	7/10/96	5	11			<i>Pyganodon grandis</i> <i>Lampsilis siliquoides</i>	EV EV
48. Rolling River, 3.5 mi N of Erickson	50°32' 99°54'	7/10/96	5	10.5	silt		<i>Anodontoides ferussacianus</i>	1
49. Rolling River, PR 263 (1 mi N and .5 mi W of Scandinavia)	50°32' 99°45'	7/10/96	4	10.1	silt		<i>Pyganodon grandis</i>	1
50. Whirlpool River, PTH 19	50°43' 99°50'	7/30/96	4	9.1	silt		<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	5 2
51. Jackfish Creek, 5 mi N and 4 mi E of Lake Audy	50°47' 100°08'	7/31/96	3	9.1	gravel/silt/sand gravel/silt/sand	55 55	<i>Pyganodon grandis</i> <i>Lampsilis siliquoides</i>	10 11
52. Whirlpool River, Whirlpool Lake	50°42' 99°48'	7/31/96	3	7.7	gravel/silt/sand	27 27	<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	4 1

LOCATION	N LAT. W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
53. Clear Creek, 1 mi E of Crawford Park	50°50' 100°05'	8/1/86	3	16.7			<i>Pyganodon grandis</i>	EV
54. Clear Creek, PR 354 (1.5 mi S and 1 mi W of Lake Audy)	50°41' 100°09'	8/1/86	3	6.5	sand/gravel/silt sand/gravel/silt sand/gravel/silt	34 34 34	<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	2 5 1
55. Pipestone Creek, 4 mi N of Reston	49°37' 101°05'	8/12/86		10.5			<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	EV EV EV
56. Pipestone Creek, 1.5 mi W of Kola	49°50' 101°23'	8/12/86		14.6	sand	58	<i>Lasmigona complanata</i> <i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	EV 2 EV EV
57. Gainsborough Creek, 3 mi W and 1.5 mi N of Lyleton	49°04' 101°14'	8/13/86					<i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i>	EV EV
58. Antler River, 2 mi S and 2 mi E of Lyleton	49°01' 101°08'	8/13/86		8.1			<i>Lasmigona complanata</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	EV EV EV
59. Medora Creek, 1 mi E and 1 mi N of Napinka	49°20' 100°49'	8/13/86	3	4.3			<i>Pyganodon grandis</i>	EV
60. Souris River, 2 mi N and 1.5 mi W of Lauder		8/13/86	6	36	silt/sand		<i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	EV 10
61. Souris River, Buncloody	49°32' 100°03'	8/14/86	6	48.3	shale shale shale		<i>Lasmigona complanata</i> <i>Pyganodon grandis</i> <i>Strophitus undulatus</i> <i>Lampsilis siliquoidea</i>	4 EV 1 5
62. Pipestone Creek, Cromer	49°44' 101°14'	8/15/86		13.6	sand/silt/gravel sand/silt/gravel sand/silt/gravel	55 55 55	<i>Lasmigona complanata</i> <i>Anodontoides ferussacianus</i> <i>Pyganodon grandis</i> <i>Lampsilis siliquoidea</i>	1 11 4 EV

LOCATION	N LAT. W LONG.	DATE	ORD	W(m)	SUBSTRATE	D(cm)	SPECIES	N
63. Oak Creek, 1 mi S and 2 mi E of Treestbank	49°37' 99°34'	8/22/96	4	5.5	sand	26	<i>Fusconala flava</i>	2
					sand	26	<i>Lasimigona complanata</i>	2
					sand	26	<i>Anodontoides ferussacianus</i>	2
					sand	26	<i>Pyganodon grandis</i>	8
					sand	26	<i>Lampsilis siliquioidea</i>	9
							<i>Lampsilis ovata</i>	EV

ORD = stream order; W = stream width; D = depth; N = number of individuals; EV = empty valves

APPENDIX 2: LOCATIONS OF SPECIES

SPECIES	LOCATION
<i>Fusconaia flava</i>	Assiniboine River, Hwy 1 Assiniboine River, river km 57 Assiniboine River, river km 64 Assiniboine River, river km 73 Assiniboine River, river km 154 Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Souris River, PTH 2 (1 mi S and 1.5 mi E of Wawanesa) Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov Rec Park Little Saskatchewan River, 4 mi S and 2 mi E of Carnegie Birdtail River, PR 477 (3 mi S and 4 mi W of Birtle) Oak Creek, 1 mi S and 2 mi E of Treesbank
<i>Amblema plicata</i>	Assiniboine River, Hwy 1 Assiniboine River, river km 15 Assiniboine River, river km 18 Assiniboine River, river km 23 Assiniboine River, river km 28 Assiniboine River, river km 32 Assiniboine River, river km 73 Assiniboine River, river km 77 Assiniboine River, river km 57 Assiniboine River, river km 64 Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov Rec Park
<i>Quadrula quadrula</i>	Assiniboine River, river km 32 Assiniboine River, river km 47 Assiniboine River, river km 73 Assiniboine River, river km 64 Assiniboine River, river km 77 Assiniboine River, river km 154
<i>Lasmsgona complanata</i>	Assiniboine River, river km 47 Assiniboine River, river km 18 Souris River, PR 345 (9 mi E of Bede) Souris River, Buncloody Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City Little Saskatchewan River, PR 354 (3 mi S of Elphinstone) Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov. Rec. Park Shell River, PTH 83 (1 mi N and 2 mi E of Inglis) Shell River, PTH 5 (1 mi N of Shevlin) Shell River, PR 367 (6 mi E and 2.5 mi N of Boggy Creek) Birdtail River, PR 359 (7 mi W of Vista) Pipestone Creek, 1.5 mi W of Kola Pipestone Creek, Cromer Antler River, 2 mi S and 2 mi E of Lyleton Oak Creek, 1 mi S and 2 mi E of Treesbank Cypress River, 5 mi N of Holland and 3 mi W of PTH 34 Cypress River, 1 mi W of Cypress River and 1 mi S of PTH 2
<i>Lasmsgona compressa</i>	Assiniboine River, river km 64 Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City Shell River, PR 367 (6 mi E and 2.5 mi N of Boggy Creek) Cypress River, 5 mi N of Holland and 3 mi W of PTH 34 Cypress River, St. Alphonse
<i>Anodontoides ferussacianus</i>	Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Rolling River, 3.5 mi N of Erickson Rolling River, PTH 263 (1 mi N and .5 mi W of Scandinavia) Birdtail River, 1 mi N and 1 mi E of Mears Shell River, PR 367 (6 mi E and 2.5 mi N of Boggy Creek) East Shell River, PR 366 (6 mi N of PR 367 and 7 mi S of PR 271) Golden Creek, 1 mi S and 1 mi E of Glenloch Silver Creek, 1.5 mi E and 2.5 S of Gambler

SPECIES	LOCATION
	Clear Creek, PR 354 (1.5 mi S and 1 mi W of Lake Audy)
	Jackfish Creek, 5 mi N and 4 mi E of Lake Audy
	Pipestone Creek, 4 mi N of Reston
	Pipestone Creek, 1.5 mi W of Kola
	Pipestone Creek, Cromer
	Gainsborough Creek, 3 mi W and 1.5 mi N of Lyleton
	Oak Creek, 1 mi S and 2 mi E of Treesbank
	Cypress River, 5 mi N of Holland and 3 mi W of PTH 34
	Cypress River, 1 mi W of Cypress River and 1 mi S of PTH 2
	Cypress River, St. Alphonse
	Cypress River, 1.5 mi N and 1 mi W of St. Alphonse
	Cypress River, 6 mi E of Holland and 6 mi N of PTH 2
<i>Pyganodon grandis</i>	Assiniboine River, river km 157
	Souris River, PR 345 (9 mi E of Bede)
	Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank)
	Souris River, PTH 2 (1 mi S and 1.5 mi E of Wawanesa)
	Souris River, 2 mi N and 1.5 mi W of Lauder
	Souris River, Buncloody
	Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City
	Little Saskatchewan River, PR 354 (3 mi S of Elphinstone)
	Shell River, PTH 83 (1 mi N and 2 mi E of Inglis)
	Shell River, PTH 5 (1 mi N of Shevlin)
	Shell River, PR 367 (6 mi E and 2.5 mi N of Soggy Creek)
	East Shell River, PR 366 (6 mi N of PR 367 and 7 mi S of PR 271)
	Birdtail River, PR 477 (3 mi S and 4 mi W of Birtle)
	Birdtail River, PTH 16 (1 mi N and 1.5 mi W of Solsgirth)
	Birdtail River, 1 mi N and 1 mi E of Mears
	Birdtail River, PR 359 (7 mi W of Vista)
	Silver Creek, 1.5 mi E and 2.5 S of Gambler
	Rolling River, 7.5 mi S and 2 mi W of Erikson
	Rolling River, 3.5 mi N of Erickson
	Rolling River, PTH 263 (1 mi N and .5 mi W of Scandinavia)
	Pipestone Creek, 4 mi N of Reston
	Pipestone Creek, 1.5 mi W of Kola
	Pipestone Creek, Cromer
	Gainsborough Creek, 3 mi W and 1.5 mi N of Lyleton
	Antler River, 2 mi S and 2 mi E of Lyleton
	Medora Creek, 1 mi E and 1 mi N of Napinka
	Boggy Creek, 6 mi W and 3 mi N of Roblin
	Whirlpool River, PTH 19
	Whirlpool River, Whirlpool Lake
	Clear Creek, 1 mi E of Crawford Park
	Clear Creek, PR 354 (1.5 mi S and 1 mi W of Lake Audy)
	Jackfish Creek, 5 mi N and 4 mi E of Lake Audy
	Oak Creek, 1 mi S and 2 mi E of Treesbank
	Cypress River, 5 mi N of Holland and 3 mi W of PTH 34
	Cypress River, 1.5 mi N and 1 mi W of St. Alphonse
	Cypress River, 6 mi E of Holland and 6 mi N of PTH 2
<i>Strophitus undulatus</i>	Assiniboine River, river km 18
	Assiniboine River, river km 73
	Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank)
	Souris River, Buncloody
	Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City
	Shell River, PTH 83 (1 mi N and 2 mi E of Inglis)
	Shell River, PTH 5 (1 mi N of Shevlin)
	Birdtail River, PR 359 (7 mi W of Vista)
<i>Potamilius alatus</i>	Assiniboine River, Hwy 1
	Assiniboine River, river km 15
	Assiniboine River, river km 18
	Assiniboine River, river km 23
	Assiniboine River, river km 28
	Assiniboine River, river km 45
	Assiniboine River, river km 140
	Assiniboine River, river km 154

SPECIES	LOCATION
<i>Ligumia recta</i>	Assiniboine River, Hwy 1 Assiniboine River, river km 47 Assiniboine River, river km 73 Assiniboine River, river km 77 Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov Rec Park Little Saskatchewan River, 1 mi S of Rivers Qu'Appelle River, 1 mi W of St.Lazare
<i>Lampsilis silquoidea</i>	Assiniboine River, Hwy 1 Assiniboine River, river km 15 Assiniboine River, river km 23 Assiniboine River, river km 28 Assiniboine River, river km 32 Assiniboine River, river km 57 Assiniboine River, river km 64 Assiniboine River, river km 77 Assiniboine River, river km 73 Assiniboine River, river km 84 Souris River, PR 345 (9 mi E of Bede) Souris River, Buncloody Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Souris River, PTH 2 (1 mi S and 1.5 mi E of Wawanesa) Souris River, 2 mi N and 1.5 mi W of Lauder Little Saskatchewan River, PR 354 (3 mi S of Elphinstone) Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov. Rec. Park Little Saskatchewan River, 1 mi S of Rivers Little Saskatchewan River, 1 mi S and 3 mi W of Rapid City Little Saskatchewan River, 4 mi S and 2 mi E of Carnegie Qu'Appelle River, 1 mi W of St.Lazare Shell River, PTH 83 (1 mi N and 2 mi E of Inglis) Shell River, PTH 5 (1 mi N of Shevlin) Birdtail River, PTH 16 (1 mi N and 1.5 mi W of Solsgrith) Birdtail River, PR 359 (7 mi W of Vista) Rolling River, 7.5 mi S and 2 mi W of Erikson Whirlpool River, PTH 19 Jackfish Creek, 5 mi N and 4 mi E of Lake Audy Clear Creek, PR 354 (1.5 mi S and 1 mi W of Lake Audy) Antler River, 2 mi S and 2 mi E of Lyleton Pipestone Creek, 4 mi N of Reston Pipestone Creek, 1.5 mi W of Kola Pipestone Creek, Cromer Oak Creek, 1 mi S and 2 mi E of Treesbank Cypress River, 6 mi E of Holland and 6 mi N of PTH 2
<i>Lampsilis ovata</i>	Assiniboine River, river km 18 Assiniboine River, river km 15 Assiniboine River, river km 23 Assiniboine River, river km 28 Assiniboine River, river km 32 Assiniboine River, river km 57 Assiniboine River, river km 64 Assiniboine River, river km 73 Assiniboine River, river km 77 Assiniboine River, river km 84 Assiniboine River, river km 109 Assiniboine River, river km 115 Assiniboine River, river km 154 Assiniboine River, river km 157 Souris River, PR 340 (.5 mi E and .5 mi S of Treesbank) Little Saskatchewan River, 1.2 mi NW of Grand Valley Prov Rec Park Little Saskatchewan River, 4 mi S and 2 mi E of Carnegie Shell River, PTH 83 (1 mi N and 2 mi E of Inglis) Birdtail River, PR 477 (3 mi S and 4 mi W of Birtle) Qu'Appelle River, 1 mi W of St.Lazare Oak Creek, 1 mi S and 2 mi E of Treesbank

APPENDIX 3: OTHER COLLECTIONS

SPECIES	LOCATION	COLLECTION
<i>Fusconaia flava</i>	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
	Assiniboine River west Winnipeg	Clarke 1973
	Assiniboine River 8 miles west of Winnipeg	Clarke 1973
	Assiniboine River 12 miles northwest of St. Francis Xavier	Clarke 1973
	Souris River	Mozley 1938 (see Clarke 1973)
<i>Amblema plicata</i>	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
	Assiniboine River west Winnipeg	Clarke 1973
	Assiniboine River 8 miles west of Winnipeg	Clarke 1973
	Assiniboine River 12 miles northwest of St. Francis Xavier	Clarke 1973
	Assiniboine River at Millwood	Tyrell 1889 (see Clarke 1973)
<i>Quadrula quadrula</i>	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
	Assiniboine River at west Winnipeg	Clarke 1973
	Assiniboine River 8 miles west of Winnipeg	Clarke 1973
<i>Lasmigona complanata</i>	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
	Assiniboine River west Winnipeg	Clarke 1973
	Assiniboine River 12 miles northwest of St. Francis Xavier	Clarke 1973
	Assiniboine River at Millwood	Tyrell 1889 (see Clarke 1973)
	"Upper" Assiniboine River	Bell 1984 (see Whiteaves 1895)
	Shell River 6 miles east of Roblin	Clarke 1973
	Shell River 8 miles east of Roblin	Clarke 1973
	Shell River 9 miles north-northwest of Roblin	Clarke 1973
	Little Saskatchewan River 11 miles north-northeast of Elphinstone	Clarke 1973
	Little Saskatchewan River 10 miles north-northwest of Minnedosa	Clarke 1973
	Souris River at Souris	Sehryn 1882 (see Clarke 1973)
<i>Lasmigona compressa</i>	Shell River 6 miles east of Roblin	Clarke 1973
	Shell River 8 miles east of Roblin	Clarke 1973
<i>Anodontoides ferussacianus</i>	Souris River .5 miles northeast of Souris	Clarke 1973
<i>Pyganodon grandis</i>	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River west Winnipeg	Clarke 1973
	Little Saskatchewan River 11 miles north-northeast of Elphinstone	Clarke 1973
	Little Saskatchewan River 10 miles north-northwest of Minnedosa	Clarke 1973
	Clear Lake 4 miles and 8 miles North of Wasagamung	Clarke 1973
	Shell River 6 miles east-southeast of Roblin	Clarke 1973
	Shell River 8 miles east of Roblin	Clarke 1973
	Shell River 9 miles north-northwest of Roblin	Clarke 1973
<i>Strophitus undulatus</i>	Assiniboine River west Winnipeg	Clarke 1973
	Assiniboine River 12 miles northwest of St. Francis Xavier	Clarke 1973
	Birdtail Creek near Birtle	Mozley 1938 (see Clarke 1973)
	Shell River 6 miles east of Roblin	Clarke 1973
	Shell River 8 miles east of Roblin	Clarke 1973
<i>Potamilus alatus</i>	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
<i>Ligumia recta</i>	Assiniboine River west Winnipeg	Clarke 1973
	Assiniboine River 12 miles northwest of St. Francis Xavier	Clarke 1973

SPECIES	LOCATION	COLLECTION
	Assiniboine at Millwood	Tyrell 1888 (see Clarke 1973)
	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
<i>Lampsilis siliquoidea</i>	Numerous Records	
<i>Lampsilis ovata</i>	Assiniboine River west of Winnipeg (Headingley)	Pip 1995
	Assiniboine River from PR 241 upstream to PTH 1	Scaife and Janusz 1992
	Assiniboine River west Winnipeg	Clarke 1973
	Assiniboine River 8 miles west of Winnipeg	Clarke 1973
	Assiniboine River 12 miles northwest of St. Francis Xavier	Clarke 1973
	Assiniboine at Millwood	Tyrell 1888 (see Clarke 1973)
	Shell River 6 miles east of Roblin	Clarke 1973
	Shell River 9 miles north-northwest of Roblin	Clarke 1973